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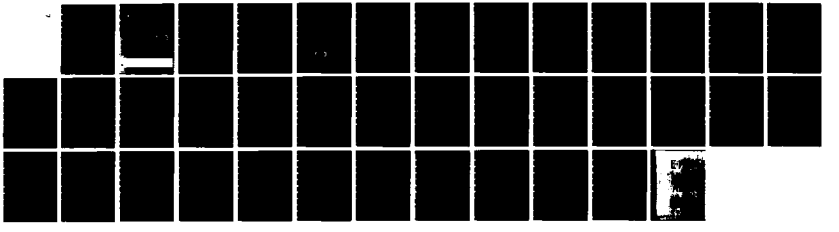

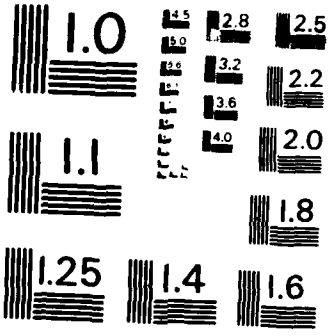

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SUMMARY

This document is the fourth supplement to the Annotated Bibliography of Human Factors Laboratory Reports (1945-1968), Technical Report NAVTRADEVCEN IH-158, February 1969, AD 686174. It provides a complete bibliographic reference and an abstract for each technical report of the Human Factors Laboratory published from 1979 through 1983. Three indexes are also included: Index by Source (contractor or in-house), Author Index, Subject Matter Index.

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1979

1. Semple, C. A., Vreuls, D., Cotton, J. C., Durfee, D. R., Hooks, J. T. and Butler, E. A. Functional design of an automated instructional support system for operational flight trainers. NAVTRAEQUIPCEN 76-C-0096-1, Contract N61339-76-C-0096, Canyon Research Group, Inc. Jan. 1979, 116pp. A065573.

   Functional requirements are presented for a highly automated, flexible instructional support system for aircrew training simulators. Automated support modes and associated features and capabilities are described. Hardware and software functional requirements for implementing a baseline system in an operational flight training context are presented. The importance of an effective man-machine interface for instructor acceptance and system utility is discussed.

2. Anders, R. M., Grady, M. W., Nowell, L. H. and Overton, M. A. A laboratory system for air intercept controller training. NAVTRAEQUIPCEN 78-C-0053-1, Contract N61339-78-C-0053, Logicon, Inc. Jan. 1979, 71pp. A069060.

   A laboratory model of an air intercept controller (AIC) training system was developed. This model was used to identify and validate instructional features of an automated, adaptive AIC training system. A preliminary specification of simulation and instructional requirements resulted from the study.

3. Grady, M. W., Porter, J. E., Satzer, W. J. and Sprouse, B. D. Speech understanding in air intercept controller training system design. NAVTRAEQUIPCEN 78-C-0044-1, Contract N61339-78-C-0044, Logicon, Inc. Jan. 1979, 68pp. A068612.

   Requirements were determined for a speech recognition and understanding system to support an automated training system for air intercept controllers (AIC). A combined isolated word recognition (IWR) and limited connected speech recognition (LCSR) system was developed and tested in a laboratory AIC training system model. Speech stylization constraints were minimized, resulting in particularly challenging recognition requirements. Integration of the IWR and LCSR techniques proved difficult.

4. Simon, C. W. Applications of advanced experimental methodologies to AWAVS training research. NAVTRAEQUIPCEN 77-C-0065-1, Contract N61339-77-C-0065, Canyon Research Group, Inc. Jan. 1979, 80pp. A064332.

   The philosophy behind the Aviation Wide Angle Visual System (AWAVS) human performance research program is discussed, with emphasis on the relative effectiveness of single versus multifactor experiments. Performance studies to be done in the

AWAVS simulator are described, along with a hypothetical example illustrating the use of economical multifactor designs. "Quasi-transfer" experiments in the simulator are proposed to study the relationship between transfer and simulator fidelity as a composite concept rather than as an entity. Potential means of performing multifactor transfer of training experiments more economically are suggested.

5. Barber, G. D., Hicklin, M., Meyn, C., Porter, J. E. and Slemon, G. K. Ground controlled approach controller training system. NAVTRAEQUIPCEN 77-C-0162-2, Contract N61339-77-C-0162, Logicon, Inc. Apr. 1979, 784pp. A069036.

   The design of a hardware and software system to support the experimental prototype Ground Controlled Approach Controller Training System (GCA-CTS) is described. Included are a facilities report, system interface drawings, trainee and instructor panel illustrations, and programming variable definitions and file structures.

6. Weller, D. R. Predictor displays in carrier landing training. NAVTRAEQUIPCEN IH-311, Naval Training Equipment Center. Apr. 1979, 24pp. A069890.

   Predictor displays and their potential applications to carrier landing training are discussed. Topics included are the history of predictor displays, display design considerations, new display formats, factors to be addressed in future display development, training strategies and expected benefits.

7. Hammell, T. J., Manning, H. T. and Ewalt, F. M. Training assistance technology investigation. NAVTRAEQUIPCEN 77-C-0107-1, Contract N61339-77-C-0107, Eclectech Associates, Inc. May 1979, 181pp. A072030.

   To enhance simulator-based submarine tactics training, advanced Training Assistance Technology (TAT) concepts have been developed. This report describes an empirical evaluation of the effectiveness of TAT capabilities. The experiment involved 1) selection of the trainer and course with which to conduct the evaluation; 2) formulation of the TAT training process segment; 3) development of training exercises; 4) development of performance measures; 5) identification of TAT model and display characteristics; 6) recommendations for incorporating TAT capabilities into the submarine combat systems trainer; and 7) development of a long-term research and development plan. An experimental evaluation of several TAT capabilities was accomplished in the laboratory using the MK81 Weapon Control Console with active submarine officers as subjects.

8. Hawkins, W. W. and Kribs, H. D. Technology for an efficient delivery system. NAVTRAEQUIPCEN 78-C-0129-1, Contract N61339-78-C-0129, Instructional Science and Development, Inc. Jun. 1979, 76pp. A084678.

   Evolutions in video and computer technology may be more cost- and training-effective than traditional audiovisual media. This study examined the feasibility, specifications, and costs of using such technology for advanced instructional delivery systems.

9. Harry, D. P., Porter, J. E. and Satzer, W. J. Voice interactive analysis system study. NAVTRAEQUIPCEN 78-C-0141-1, Contract N61339-78-C-0141, Logicon, Inc. Jun. 1979, 174pp. A074833.

   This study continued research and development of the LISTEN real-time, minicomputer-based, connected speech recognition system. The most effective features detected by the TTI-500 speech preprocessor were identified. Objective measures were used to demonstrate the presence of, and to evaluate, various types of information used in LISTEN. Interword timing and structural peculiarities were found to be the two most useful information sources for the two speakers investigated. Statistical models of the information sources were examined critically. The analyses revealed several ways to simplify and improve the LISTEN algorithm. Users manuals for analysis programs and for voice reference data generation programs were developed.

10. May, D., Snaket, E. and Leal, A. Knowledgeable opponent models for enemy submarine tactics in training simulators. NAVTRAEQUIPCEN 78-C-0107-1, Contract N61339-78-C-0107, Perceptronics, Inc. Jul. 1979, 75pp. A076236.

    This report describes four models which show promise for simulating a knowledgeable opponent for enemy submarine tactics in training simulators, and which can also be used to simulate friendly forces. The four approaches are: 1) the elicited probability approach; 2) the adaptive decision modeling approach; 3) the heuristic search approach; and 4) the production rules approach. A set of attributes for rating each approach is described. The attributes are then used to rate each approach. Several representative decisions are discussed and the method of application for each approach is described.

11. Kelly, M. J., Wooldridge, L., Hennessy, R. T., Vreuls, D., Barneboy, S. F., Cotton, J. C. and Reed, J. C. Air combat maneuvering performance measurement. NAVTRAEQUIPCEN IH-315/AFHRL-TR-79-3, Contract F33615-77-C-0079, Canyon Research Group, Inc. Sep. 1979, 142pp. A077429.

1979

A study was conducted to define measures of Air Combat Maneuvering (ACM) for one-versus-one free engagements on the Simulator for Air-to-Air Combat (SAAC). The study found 13 measures which were: a) sensitive to differences in pilot ACM skill level; b) diagnostic of performance proficiencies and deficiencies; c) usable by instructor pilots and compatible with their judgments, d) capable of providing results immediately after the end of the engagement; and e) compatible with current projected training and measurement hardware. When properly weighted, the 13 measures could be added together to form a single measure of ACM performance which accounted for 51% of the variance in free engagement performance data and predicted membership in high or low skill groups with 92% accuracy. Further development to improve the diagnostic model's accuracy was recommended, for future developmental testing and ultimate training use on the SAAC.

12. Chatfield, D. C., Marshall, P. H. and Gidcumb, C. F. Instructor model characteristics for automated speech technology (IMCAST). NAVTRAEQUIPCEN 79-C-0085-1, Contract N61339-79-C-0085, Behavioral Evaluation and Training Systems. Oct. 1979, 208pp. A079902.

Training characteristics of the Ground Controlled Approach radar controller, the Landing Signal Officer and the Air Intercept Controller were examined. Relative skills of experts and novices were compared with respect to these three functions. Several areas of basic research were reviewed in search of technologies with which an instructor model might be designed, to be incorporated in an automated speech recognition based training system. A prototype instructor model was developed, with recommendations for further research and development prior to implementation.

1980

13. Breaux, R. B., ed. Proceedings of LSO training R&D seminar. NAVTRAEQUIPCEN IH-320, Naval Training Equipment Center. Jan. 1980, 65pp. A082310.

    The exploratory development program at the Naval Training Equipment Center concerned with developing design guidance for a universal landing signal officer (LSO) waving training system was reviewed in depth during a two-day seminar. Comments, suggestions, and recommendations were provided from Fleet LSOs during the presentation. A planning session was used to discuss the direction of follow-on efforts.

14. Ciavarelli, A. P., Pettigrew, K. W. and Brictson, C. A. Development of a computer based air combat maneuvering range debrief system: interim report (Volume I). NAVTRAEQUIPCEN 78-C-0136-1, Contract N61339-78-C-0136, Dunlap and Associates, Inc. Jan. 1980, 74pp. A107342.

    An overview of the technical approach to air combat maneuvering range debrief development is provided, along with a preliminary design for the Performance Assessment and Appraisal System (PAAS) debrief system, based on key training objectives and their associated aircrew task measures. Future plans are outlined, including the further development of criterion measures across remaining training objectives.

15. Gold, D., Kleine, B., Fuchs, F., Ravo, S. and Inaba, K. Aircraft maintenance effectiveness simulation (AMES) model. NAVTRAEQUIPCEN 77-D-0028-1, Contract N61339-77-D-0028, Xyzyx Information Corporation. Feb. 1980, 114pp. A087516.

    A functional simulation model of aircraft maintenance, the Aircraft Maintenance Effectiveness Simulation (AMES), was developed and tested. AMES is a computer model that simulates the operation and maintenance of an aircraft squadron, and measures the effects of human errors on maintenance accuracy.

16. Brictson, C. A., Pettigrew, K. W., Breidenbach, S. T. and Narsete, E. M. Objective measures of landing signal officer (LSO) performance during night carrier recovery. NAVTRAEQUIPCEN 78-C-0123-1, Contract N61339-78-C-0123, Dunlap and Associates, Inc. Apr. 1980, 84pp. A098625.

    Methods to describe landing signal officer (LSO) performance during night carrier landing were developed and tested. Both terminal landing measures and approach performance measures were found to be useful in describing LSO performance variations during night carrier recovery operations. The most promising performance measurement techniques were analyzed in terms of

potential application to the development of LSO training and performance standards. Implementation of a carrier landing performance measurement system was recommended for Fleet data collection and performance assessment.

17. Hicklin, M., Barber, G. D., Bollenbacher, J., Grady, M. W., Harry, D. P., Meyn, C. and Slemon, G. K. Ground controlled approach controller training system (GCA-CTS): final technical report. NAVTRAEQUIPCEN 77-C-0162-6, Contract N61339-77-C-0162, Logicon, Inc. Apr. 1980, 112pp. A092717.

    This report describes the development of an experimental prototype Ground Controlled Approach Controller Training System (GCA-CTS), an automated adaptive training system designed to teach precision approach radar control skills. The GCA-CTS is the first to employ automated speech technologies to automate th training of a primarily verbal task. The rationale behind the system design is explained, and observations, conclusions and recommendations are provided.

18. Barber, G. D., Bollenbacher, J., Brewton, D., Harry, D. P., Hicklin, M., Meyn, C. and Slemon, G. K. Ground controlled approach controller training system (GCA-CTS): system documentation. NAVTRAEQUIPCEN 77-C-0162-3, Contract N61339-77-C-0162, Logicon, Inc. Jun. 1980, 748pp. A087190.

    This report describes the hardware and software which satisfy the functional requirements for an automated adaptive training system for Ground Controlled Approach Controllers. Hardware descriptions include the system controller, trainee station, and instructor station. Software descriptions include modes of operation, speech understanding, speech generation, performance measurement, and the simulation of pilot, environment, radar and displays.

19. Collyer, S. C., Ricard, G. L., Anderson, M., Westra, D. P. and Perry, R. A. Field of view requirements for carrier landing training. NAVTRAEQUIPCEN IH-319/AFHRL-TR-80-10, Naval Training Equipment Center. Jun. 1980, 54pp. A087190.

    Simulator field-of-view (FOV) requirements were studied in conjunction with two approaches to training daytime carrier circling approach and landing. Pilot subjects used the Advanced Simulator for Pilot Training (ASPT) at Williams Air Force Base, with computer generated visual image simulation. Conditions included a circling approach with wide field-of-view and with narrow field-of-view, and a straight-in approach with narrow field-of-view. Performance measures included: a) instantaneous measures; b) continuous measures; c) measures representing the

success of the approach at touchdown; and d) Landing Signal Officer ratings. Results were statistically analyzed. The experimental findings indicated that there were no clear training advantages with a wide-angle display, and that the most cost-effective means of carrier landing training was to practice straight-in approaches, using a narrow-angle visual display.

20. Hicklin, M. Ground controlled approach controller training system (GCA-CTS): student guide. NAVTRAEQUIPCEN 77-C-0162-4, Contract N61339-77-C-0162, Logicon, Inc. Jun. 1980, 228pp. A091930.

    This manual covers the basic concepts involved in ground controlled approach air traffic control procedures. It is intended for use in conjunction with the computer managed instruction provided by the Ground Controlled Approach Controller Training System (GCA-CTS).

21. Hicklin, M. Ground controlled approach controller training system (GCA-CTS): instructor guide. NAVTRAEQUIPCEN 77-C-0162-5, Contract N61339-77-C-0162, Logicon, Inc. Jun. 1980, 129pp. A091846.

    This manual provides detailed information about the use of the Ground Controlled Approach Controller Training System (GCA-CTS) including use of the GCA-CTS in training, daily operational readiness testing and GCA-CTS startup/shutdown procedures.

22. Ciavarelli, A. P., Williams, A. M. and Stoffer, G. R. Training improvements for the tactical aircrew training system (TACTS): project summary report. NAVTRAEQUIPCEN 78-C-0136-3, Contract N61339-78-C-0136, Dunlap and Associates, Inc. Aug. 1980, 38pp. A107003.

    This report presents summarized information related to the Tactical Aircrew Combat Training System (TACTS) training improvements program. Subjects addressed include: a) the computer-based TACTS debrief system, known as the Performance Assessment and Appraisal System (PAAS); and b) a problem definition study of air intercept missile (AIM) envelope recognition training. Recommendations for improving Fleet envelope recognition training are reviewed.

23. McCauley, M. E. and Semple, C. A. Precision approach radar training system (PARTS) training effectiveness evaluation. NAVTRAEQUIPCEN 79-C-0042-1, Contract N61339-79-C-0042, Canyon Research Group, Inc. Aug. 1980, 128pp. A091912.

    The use of automated speech recognition and synthesis in training programs was addressed through the evaluation of the experimental prototype Precision Approach Radar Training System (PARTS).

Students trained on PARTS were compared with students from the normal precision approach radar training course in a pseudo transfer of training study. No significant difference between the two student groups was found. Observation, interviews, and a performance measurement validation study revealed problems with PARTS courseware which led to limited instructor acceptance. Student acceptance was high. A cost-effectiveness analysis indicated potential savings in personnel utilization through the use of automated speech technologies. Suggestions were made for PARTS design modifications and for future applications of automated speech technologies.

24. Van Hemel, P. E., Van Hemel, S. B., King, W. J. and Breaux, R. B. Training implications of airborne applications of automated speech recognition technology. NAVTRAEQUIPCEN 80-D-0009-0155-1, Contract N61339-80-D-0009-0155, Ergonomics Associates, Inc. Oct. 1980, 59pp. A098625.

Developments in automated voice recognition and synthesis may make these technologies applicable to airborne systems. The human factors of using automated speech recognition (ASR) for communication with machines were studied by analyzing research systems using voice technology. Specific recommendations were made with respect to instructional systems development and particularly to the development of training media. Training for the use of airborne ASR systems should be based on front-end analyses performed by professionals who understand the human factors of ASR-human interaction. Such analyses should explicitly consider the integration of ASR into airborne task performance. Training should prepare users to register reference patterns effectively, to experiment with ASR use in order to develop a personal but effective style of information exchange, and to deal with recognition failures effectively.

25. Hooks, J. T., Butler, E. A., Reiss, M. J. and Petersen, R. J. Landing signal officer (LSO) laboratory system software. NAVTRAEQUIPCEN 78-C-0151-1, Contract N61339-78-C-0151, Logicon, Inc. Nov. 1980, 76pp. A095730.

A laboratory landing signal officer (LSO) training system was developed and demonstrated. The system was designed to enable LSO task interaction with simulated carrier approaches, by using graphics simulation, automated speech recognition and computer control pilot and aircraft functions. The system also included automated prompting, performance feedback and LSO performance evaluation. Study results and recommendations for the capabilities and utilization of an experimental prototype LSO training system were described.

1980

26. Hooks, J. T. and McCauley, M. E. Training characteristics of LSO reverse display. NAVTRAEQUIPCEN 79-C-0101-2, Contract N61339-79-C-0101, Logicon, Inc. Nov. 1980, 100pp. A096864.

This report describes the results of a training effectiveness evaluation of the Landing Signal Officer (LSO) reverse display portion of the A7E Night Carrier Landing Trainer. Evaluation methods included survey and observation. A syllabus for Phase II and III LSO training with the LSO Reverse Display is included. An annotated bibliography on LSO is also included.

1981

27. Ricard, G. L., Parrish, R. V., Ashworth, B. R. and Wells, M. D. The effects of various fidelity factors on simulated helicopter hover. NAVTRAEQUIPCEN IH-321, Naval Training Equipment Center. Jan. 1981, 65pp. A102028.

    The effects of the cues of aircraft motion, of delays in a visual scene, and of movement of a ship model were examined by measuring pilots' ability to hover a simulated helicopter near a destroyer class ship. In addition, an effort was made to determine the effect a head-up display of aircraft position had on the measures of control. Best performance was seen with the moving base simulation, followed by the g-seat conditions. The fixed-base conditions resulted in the poorest control. Addition of a longer visual delay improved performance, but movement of the ship model and removal of the head-up display had little effect. It was recommended that platform based motion cueing be used in trainers for aircrews of marginally stable vehicles requiring hover capability.

28. McGuinness, J., Bouwman, J. H. and Forbes, J. M. Simulator sickness occurrences in the 2E6 air combat maneuvering simulator (ACMS). NAVTRAEQUIPCEN 80-C-0135-4500-1, Contract N61339-80-C-0135, Person-System Integration, Limited. Feb. 1981, 49pp. A097742.

    A preliminary study was undertaken to assess the rate of occurrence and the degree of severity of "simulator sickness" experienced by individuals who "flew" the Device 2E6, Air Combat Maneuvering Simulator. Twenty-seven percent of the aircrews from F-4 and F-14 squadrons at NAS Oceana, Virginia Beach, Virginia, experienced various symptoms during and/or after simulator use. Sixty-one percent of those affected reported persistence of symptoms from fifteen minutes to six hours after the end of a simulator session. Further investigation of simulator sickness was planned following modifications to the simulator.

29. Baron, S. An optimal control model analysis of data from a simulated hover task. NAVTRAEQUIPCEN 80-C-0055-1, Contract N61339-80-C-0055, Bolt, Beranek and Newman, Inc. May 1981, 54pp. A099895.

    The Optimal Control Model for pilot vehicle analysis was applied to a simulated helicopter hover task. The model was used to predict the effects on performance of changes in motion cues, visual delay and ship movement. Predicted results were compared with data obtained in a separate experimental study of these effects. The OCM correctly predicted almost all the trends observed in the data and its predictions were all within the bounds of pilot-to-pilot variability.

1981

30. Breidenbach, S. T. and Brictson, C. A. Development of the automated performance assessment and remedial training system (APARTS): a landing signal officer training aid. NAVTRAEQUIPCEN 79-D-0105-1, Contract N61339-79-D-0105, Dunlap and Associates, Inc. Jun. 1981, 45pp. A106224.

    Development of the Automated Performance Assessment and Remedial Training System (APARTS) is described. APARTS is an automated training aid designed to assist the landing signal officer (LSO) in training pilots during the acquisition of carrier landing skills. APARTS is based on general learning principles and provides graphic displays of pilot landing problems for LSO evaluation and pilot feedback. APARTS also integrates field carrier landing practice with night carrier landing trainer instruction. An improved APARTS conceptual model and two computer programs to process and display pilot performance data are described. Future APART training effectiveness improvements are outlined.

31. King, W. J. and Van Hemel, P. E. Toward improved maintenance training programs: the potentials for training and aiding the technician. NAVTRAEQUIPCEN IH-327, Naval Training Equipment Center. Jul. 1981, 74pp. A103476.

    This report consists of papers presented at the Third Biennial Maintenance Training and Aiding Conference sponsored by the Naval Air Systems Command and hosted by the Human Factors Laboratory, Naval Training Equipment Center. The papers address the role of job aiding and performance in the capability development and training of the maintenance technician. It appears that the integration of training and aiding is needed to meet maintenance requirements for the Navy's increasingly sophisticated equipment.

32. Anders, R. M., Gannis, M. P., Halley, R. and Regelson, E. C. Measurement of student achievement for air intercept controller prototype training system. NAVTRAEQUIPCEN 78-C-0182-5, Contract N61339-78-C-0182, Logicon, Inc. Aug. 1981, 16pp. A106726.

    This report discusses the Measurement of Student Achievement model which, utilized in the experimental prototype Air Intercept Controller Training System, presents formats for automated measurement reporting.

33. Brictson, C. A. and Breidenbach, S. T. Conceptual development of a preliminary LSO carrier landing training aid. NAVTRAEQUIPCEN 77-C-0166-2, Contract N61339-77-C-0166, Dunlap and Associates, Inc. Sep. 1981, 36pp. A107002.

A conceptual plan designed to aid the landing signal officer (LSO) in training carrier landing skills is described. The Automated Performance Assessment and Remedial Training System (APARTS) integrates the Night Carrier Landing Trainer with Field Carrier Landing Practice. Two computer programs developed for use with APARTS process, store, and summarize LSO grades and comments for a pilot's landing performance. Program printouts provide diagnostic training feedback. Remedial instruction is specified to correct landing technique problems identified during training. Future development and integration of APARTS for improved carrier training effectiveness is outlined.

34. Ciavarelli, A. P., Williams, A. M. and Stoffer, G. R. Training improvements for the tactical aircrew training system (TACTS): project summary report. NAVTRAEQUIPCEN 78-C-0136-3, Contract N61339-78-C-0136, Dunlap and Associates, Inc. Sep. 1981, 38pp. A107003.

    This final report summarizes progress in the Tactical Aircrew Combat Training System (TACTS) training improvements program. Two major topics considered are: a) the computer based debrief system called the Performance Assessment and Appraisal System (PAAS); and b) Air Intercept Missile (AIM) envelope recognition training. The preliminary design for the PAAS has been completed and one section is undergoing test and evaluation. Air-to-air missile envelope training problems have been studied, and recommendations for improving such training are provided.

35. Halley, R., Hooks, J. T., Lankford, H. G. and Nowell, L. H. Behavioral objectives for air intercept controller prototype training system. NAVTRAEQUIPCEN 78-C-0182-1, Contract N61339-78-C-0182, Logicon, Inc. Sep. 1981, 64pp. A107001.

    This report presents an in-depth job task analysis of the Air Intercept Controller (AIC) with a graphic representation of the AIC's tasks in a task flow diagram. From the analysis, behavioral objectives are developed to mission, terminal and enabling levels.

36. Grady, M. W., Halley, R. and Nowell, L. H. Ordinal syllabus. NAVTRAEQUIPCEN 78-C-0182-3, Contract N61339-78-C-0182, Logicon, Inc. Sep. 1981, 148pp. A107000.

    This report presents the ordinal syllabus for the air intercept controller prototype training system courseware. The instructional courseware is identified in detail at the lesson level. Associated behavioral objectives, end of course standards, new vocabulary and new Naval Tactical Data System functions are also listed. Documentation of the syllabus development process is provided.

1981

37. Smith, N. M., Granberry, R. D., Halley, R., Kerr, D., King, M. R. and Regelson, E. C. Prototype equipment student guide for ACE (air intercept controller prototype training system). NAVTRAEQUIPCEN 78-C-0182-10, Contract N61339-78-C-0182, Logicon, Inc. Sep. 1981, 166pp. A106999.

    This student manual for use with the Air Controller Exerciser (ACE) training system provides descriptions of the component parts of the system and the operating procedures associated with them. Student objectives and syllabus of the training course offered with ACE are described. The vocabulary elements and system training procedures used with the system's advanced computer speech recognition and generation capabilities are also fully documented.

38. Stoffer, G. R. Performance measurement and the Navy's tactical aircrew training system (TACTS). NAVTRAEQUIPCEN IH-333, Naval Training Equipment Center. Sep. 1981, 29pp. A110669.

    The development and use of the Tactical Aircrew Training System (TACTS) as a means for training advanced air combat skills are described. Pilot performance measurement capabilities of the TACTS are reviewed in terms of their value for pilot selection, aircrew training, assessment and simulator design. Several approaches and methods used to conceptualize and measure air combat maneuvering performance are presented. Limitations in existing TACTS performance measurement capabilities are illustrated in terms of several psychometric, training and TACTS operational user feasibility requirements for a system of performance measurement. It is concluded that while the existing TACTS represents a highly advanced aviation engineering technology that can provide extremely valuable training, that same technology has largely ignored the functional requirements for a system of human performance measurement.

39. Halley, R., Hooks, J. T., Lankford, H. G. and Nowell, L. H. Objectives hierarchy for air intercept controller prototype training system. NAVTRAEQUIPCEN 78-C-0182-2, Contract N61339-78-C-0182, Logicon, Inc. Dec. 1981, 210pp. A110847.

    This report presents the objectives hierarchy for development of the Air Intercept Controller Prototype Training System. Behavioral objectives previously developed for the system are expanded in depth and detail for tasks. Hierarchy diagrams present the subordinate objectives structures; conditions, behaviors and standards are presented for component tasks within the objectives hierarchy.

1981

40. Regelson, E. C., Slemon, G. K., VerSteeg, R. and Halley, R. Functional design for air intercept controller prototype training system. NAVTRAEQUIPCEN 78-C-0182-8, Contract N61339-78-C-0182, Logicon, Inc. Dec. 1981, 236pp. A113209.

This report provides the technical plan for definition, design, development and implementation of the software for the Air Intercept Controller Prototype Training System. The introduction describes the software characteristics placed in context with the purpose, design and operational concept of the overall training system. A section on program design addresses the functional and operational considerations of the software, while the system design section discusses equipment interactions and interfaces. Also included is a discussion of training and system constraints.

1982

41. Mixon, T. R. and Moroney, W. F. An annotated bibliography of objective pilot performance measures. NAVTRAEQUIPCEN IH-330, Department of Operations Research, Naval Postgraduate School. Jan. 1982, 408pp. A113170.

    This bibliography covering the period from 1962 to 1981 is divided into three categories: 1) objective pilot performance measurement; 2) subjective pilot performance measures; and 3) general analysis and review articles. For each of the objective measure articles reviewed, subjects, equipment, scenario, measures and summary are reported. For the subjective measures and general analysis articles the authors' abstracts are provided. The bibliography contains 189 objective articles, 30 subjective and 143 analysis and review articles. Author, subject matter, scenario, performance measurement, source and accession number indexes are included.

42. Crowe, W., Hicklin, M., Kelly, M. J., Obermayer, R. W. and Satzer, W. J. Team training through communications control: final report. NAVTRAEQUIPCEN 80-C-0095-1, Contract N61339-80-C-0095, Vreuls Research Corporation and Logicon, Inc. Feb. 1982, 284pp. A118504.

    This report documents the results of an analysis of the team training problem in an anti-submarine warfare context. Based on this analysis, a system concept for a Team Training Through Communications Control Training/Research Demonstration System is presented. System functional requirements are described and a staged implementation plan is recommended.

43. Halley, R., King, M. R. and Regelson, E. C. Functional requirement for air intercept controller prototype training system. NAVTRAEQUIPCEN 78-C-0182-4, Contract N61339-78-C-0182, Logicon, Inc. Apr. 1982, 50pp. A114318.

    This report presents the functional requirement for development of the experimental prototype Air Intercept Controller Training System. Training requirements are discussed in establishing preliminary definitions of hardware and software which will support an automated adaptive training system which incorporates advanced computer speech recognition and generation.

44. Granberry, R. D., Halley, R. and King, M. R. Prototype configuration report for air intercept controller prototype training system. NAVTRAEQUIPCEN 78-C-0182-6, Contract N61339-78-C-0182, Logicon, Inc. Jul. 1982, 58pp. A118750.

1982

This report delineates the design criteria and human engineering principles and practices to be applied in the design and general arrangements of the Air Controller Exerciser for the Air Intercept Controller Prototype Training System. The specifics for site preparation, detailed floor plans and environmental requirements will be developed in the prototype facilities report to follow.

45. Hughes, R. G., Lintern, G., Wightman, D. C., Brooks, R. B. and Singleton, J. Applications of simulator freeze to carrier glideslope tracking instruction. NAVTRAEQUIPCEN 78-C-0060-9/AFHRL-TR-82-3, Contract N61339-78-C-0060, Canyon Research Group, Inc. Jul. 1982, 50pp. A118862.

    Twenty-five experienced F-4 and F-16 Air Force pilots were instructed in carrier landings in the Visual Technology Research Simulator (VTRS). Experimental training techniques employing the simulator's "freeze" feature were compared to a conventional approach with no "freezes" imposed during the training sequence. Although pilots trained under "freeze" conditions developed control strategies that distinguished them from pilots trained by conventional measures, no differences were found between these groups on rate or extent of learning. Pilots trained under "freeze" conditions indicated that the simulator "freeze" was frustrating and added to the difficulty of the task. The pilots further reported being more motivated to avoid the "freeze" than to perform the task correctly during training.

46. Ricard, G. L., Crosby, T. N. and Lambert, E. Y. Workshop on instructional features and instructor/operator station design for training systems. NAVTRAEQUIPCEN IH-342, Naval Training Equipment Center. Oct. 1982, 192pp. A121770.

    This report documents papers presented at the Workshop on Instructional Features and Instructor/Operator Station Design for Training Systems held at the Naval Training Equipment Center on 10 and 11 August 1982. The papers describe research and development projects, human engineering surveys, advances in trainer design, and suggestions for instructional features to be developed. Current attitudes are presented with respect to functions which training devices should include.

47. McCauley, M. E., Cotton, J. C. and Hooks, J. T. Automated instructor models for LSO training systems. NAVTRAEQUIPCEN 80-C-0073-1, Contract N61339-80-C-0073, Canyon Research Group, Inc. Oct. 1982, 220pp. A121177.

    This report identifies instructor functions to be automated in a Landing Signal Officer Training System (LSOTS), including instruction, performance assessment, performance feedback,

maintaining trainee records, and individualized curriculum control. Functional design characteristics of the training system executive and system interfaces with the trainee and instructor are also described. Characteristics of a software model intended to accomplish the instructor model functions are presented, along with an LSO knowledge base generated to represent important variables in the LSO's task during carrier aircraft recovery and a preliminary training syllabus.

48. Charles, J. P. Device 2F119 (EA-6B WST) instructor console review. NAVTRAEQUIPCEN 81-M-1083-1, Contract N61339-81-M-1083, Icon, Inc. Nov. 1982, 87pp. A122639.

    A survey of training device 2F119 instructor console operating problems was conducted. Feasible solutions were developed. Recommendations, conclusions, and general design guidance information were developed.

49. McCauley, M. E., Root, R. W. and Muckler, F. A. Training evaluation of an automated training system for air intercept controllers. NAVTRAEQUIPCEN 81-C-0055-1, Contract N61339-81-C-0055, Canyon Research Group, Inc. Dec. 1982, 119pp. A123289.

    This report describes the evaluation of an experimental prototype training system, the Air Controller Exerciser (ACE), which was developed to demonstrate the use of new technologies for training, including computer speech recognition and generation, videodisc, automated instruction, automated performance measurement and syllabus control, and speech-interactive simulation. Combining these emerging technologies promises to reduce the requirements for instructor manpower and other training support personnel, while providing effective, consistent training. Empirical studies were conducted to validate the performance measurement system, compare ACE to the traditional training program in a transfer of training test, and determine the accuracy of the speech recognition system. Training system features were analyzed and user acceptance was assessed. The cost-benefit relationship of implementing ACE technologies was estimated. Changes and improvements were recommended to upgrade ACE to operational training system capability.

1983

50. Chatfield, D. C., Klein, G. L. and Coons, D. INSTRUCT: an example of the role of artificial intelligence in voice-based training systems. NAVTRAEQUIPCEN 80-C-0061, Contract N61339-80-C-0061, Behavioral Evaluation and Training Systems. Jan. 1983, 125pp. A124126.

This report describes a study of the potential use of artificial intelligence (AI) to enhance the training effectiveness of systems combining computer speech recognition technologies with standard teaching and performance assessment methods. AI technologies which could be used in implementing automated instructor capabilities were identified and analyzed for feasibility. A simulated student model developed with AI technologies was used to test the effectiveness of the automated instructor in responding to individualized student needs.

51. Marcue, N. C., Blaiwes, A. S. and Bird, R. G. Computer aided system for developing aircrew training (CASDAT). NAVTRAEQUIPCEN 79-C-0076-1, Contract N61339-80-0-0009, Veda, Inc. Mar. 1983, 153pp. A128530.

A research program was initiated to investigate automation and other aids as tools to reduce time and personnel requirements of instructional systems development (ISD). Theoretical feasibility was demonstrated by analyzing prior manual ISD efforts to develop a generic task list model which was used to build a task list data base. The data base served as the basis for developing aids to complete other ISD steps. Task listing, objectives hierarchy, media selection, syllabus design and lesson specification were identified as ISD steps suitable for automation. An analysis of aiding systems and their capabilities indicated that cost and time savings could be best achieved using a computer/text editor system in conjunction with the generic task model approach. A prototype set of computer based aids, the Computer Aided System for Developing Aircrew Training (CASDAT), was devised to assist a system developer in accomplishing five ISD steps for a small number of mission phases and aircrew jobs. Later the system was expanded to provide automated aid to a wider range of aircrew phases of flight and aircrew jobs. Preliminary data indicate that the system generates quality ISD products for aircrew training programs in significantly less time than is required using traditional methods. A full-scale field trial of CASDAT is recommended to measure its contribution to aircrew training design.

52. Osborne, S. R., Semple, C. A. and Obermayer, R. W. Three reviews of the instructional support system (ISS) concept. NAVTRAEQUIPCEN 81-C-0081-1, Contract N61339-81-C-0081, Vreuls Research Corporation, Allen Corporation of America and Canyon Research Group, Inc. Mar. 1983, 67pp. A129043.

The Instructional Support System (ISS) examined in this report is aimed at increasing the utilization of existing simulators and improving the quality of training. The ISS can be strapped onto existing flight simulators without hardware or software modification, to provide an interface which instructors and students can use instead of the existing displays and controls. The ISS can also relieve the instructor of ancillary instructional tasks, provide automated briefings and performance measurements, and serve as a research tool to enable solution of unresolved design issues. This report analyzes the ISS from the viewpoints of instructional design, operational instruction, and performance measurement design.

53. Cotton, J. C. and McCauley, M. E. Voice technology design guides for Navy training systems. NAVTRAEQUIPCEN 80-C-0057-1, N61339-80-C-0057, Canyon Research Group, Inc. Mar. 1983, 182pp. A129145.

This project was directed toward gathering information about applications of automated speech technology (AST) and formulating design guidelines for the use of AST in Navy training systems. Information was obtained from three major sources: a review of the scientific and technical literature; a review of the documentation of prior Navy AST training system prototypes; and interviews with key scientists. Guidelines for the design and development of AST training systems were presented in four categories: voice subsystems; instructor models; simulation and event control; and training system executive. Design guidelines were generic and intended to be applicable to a wide range of training tasks. Computer speech recognition and generation were characterized as rapidly advancing technologies that are ready now for application in automated training systems. A human factors perspective was advanced by emphasizing the importance of the trainee in the design of complex automated training systems. Both complex and simple applications of AST for training were addressed, with the emphasis on complex systems designed to reduce the need for instructors and other training support personnel.

54. McCauley, M. E. and Borden, G. J. Computer based landing signal officer carrier aircraft recovery model. NAVTRAEQUIPCEN 77-C-0110-1, Contract N61339-77-C-0110, Human Performance Research, Inc. Sep. 1983, 67pp. A133507.

This report describes a research effort to develop a Landing Signal Officer (LSO) decision-making model to serve as a performance criterion in an automated training system. Analytic methods including observations, interviews, conferences and literature reviews were used to collect data concerning LSO functions and decision-making processes during carrier aircraft recovery operations.

1983

55. McDonald, L. B. Analysis of fidelity requirements for electronic equipment maintenance: analysis of troubleshooting logic. NAVTRAEQUIPCEN 81-C-0065-2, Contract N61339-81-C-0065, McDonald and Associates, Inc. Sep. 1983, 53pp.

The objective of the study was to determine the troubleshooting logic used by Basic Electricity and Electronics (BE&E) students while troubleshooting actual printed circuit boards. Since complexity of the troubleshooting task was certain to affect student troubleshooting behavior, three different printed circuit boards of varying levels of complexity were used in the study. Every point probed by the student during a performance test was recorded by an observer. The data presented in this report are from one performance test each for 62 students on each of the three boards. Some students were tested on more than one board, so that the resulting 186 observations were completed using 99 students. Although the dominant troubleshooting strategy was random, students made considerable use of logical approaches. Results suggest that simulated training equipment should be designed to make points active in the following sequence: 1) points required to locate the simulated fault using the Half-Split technique; 2) points on the less reliable components; 3) points for the input and output of each circuit; 4) points that should be suggested by the fault symptoms; and 5) all points along the board for Linear Signal Tracing. In addition, test points for the board input and all circuit outputs should be active. The ratio of distractor points to relevant points should be approximately 4 to 1.

56. Baron, S. A pilot/vehicle model analysis of the effects of motion cues on Harrier control tasks. NAVTRAEQUIPCEN 80-D-0014-0019-1, Contract N61339-80-D-0014, Bolt, Beranek and Newman, Inc. Sep. 1983, 33pp.

Pilot control of a simulated AV-8B (Harrier) aircraft was analyzed using the Optimal Control Model, a well-established pilot-vehicle model. The effects on closed-loop performance of aircraft configuration (SAS-ON or SAS-OFF), flight condition (hover or cruise), and simulator motion cueing condition (fixed-base, moving platform or g-seat) were analyzed. In addition, the interaction between these conditions and the level of pilot attention and/or skill was investigated by means of sensitivity analysis in which a parameter of the observation noise/signal ratio was systematically varied. Results indicate that motion cues could be very significant in the Harrier hover control task for the augmented (SAS-OFF) vehicle. However, for hover with SAS-ON and for cruise flight, motion cues are predicted to be of marginal utility for improving performance; for these tasks motion cues could theoretically be provided by a

g-seat with little loss in performance compared to using platform motion. The assumptions underlying the g-seat analysis have not been verified experimentally.

57. Kribs, H. D., Simpson, A. D. and Mark, L. J. Automated instructional media selection (AIMS). NAVTRAEQUIPCEN 79-C-0104-1, Contract N61339-79-C-0104, Instructional Science and Development, Inc. Oct. 1983, 100pp. A135749.

    As part of a project to design automated aids to instructional systems development, the Automated Instructional Media Selection (AIMS) model was developed. The model was designed to be flexible and widely applicable. It allows the user to define the media pool of up to 90 potential media and 90 instructional characteristics. All aspects of the media pool are updatable. A user's guide is included.

58. Hooks, J. T. and McMurry, W. S. Pilot behavior models for LSO training systems. NAVTRAEQUIPCEN 80-C-0063-2, Contract N61339-80-C-0063, Mathetics, Inc. Oct. 1983, 231pp. A135823.

    This report describes a project to develop pilot/aircraft behavior models for an automated LSO training system. Data supporting the identification of critical LSO task conditions were collected through literature search, accident report review and survey of the LSO community. Results of data collection and their implications for model development are presented. Pilot/aircraft models, a listing of key LSO learning concepts and a functional design for the models are included. An extensive bibliography is also provided.

59. Weller, D. R. Predictor displays as training aids in carrier landing. NAVTRAEQUIPCEN TN-66, Naval Training Equipment Center. Nov. 1983, 14pp.

    The effectiveness of predictor displays as training aids in carrier landing was evaluated. An experiment was performed in which two predictor displays were compared with a control condition, where the principal measure was total approaches necessary to reach criterion performance. Three presentation modes for the predictor display were also evaluated. The experiment was carried out on a low-cost device which simulated an A-7 aircraft. Analysis of the data indicated no significant differences between groups, although one predictor display consistently yielded better performance than the other conditions.

60. Spears, W. D. Processes of skill performance: a foundation for the design and use of training equipment. NAVTRAEQUIPCEN 78-C-0113-4, Contract N61339-78-C-0113, Seville Training Systems Corporation. Nov. 1983, 159 pp.

This study was designed to lay a foundation for the design of low-cost training devices through analyses of cognitive and motor skills in terms of the processing of information. Empirically based concepts were used to provide an operational means of manipulating variables during training. Methods for empirically assessing the roles of various processes were suggested. It was concluded that the analyses could be readily extrapolated to a training technology in general and to training device design in particular.

61. Charles, J. P. Device 2E6 (ACMS) air combat maneuvering simulator instructor console review. NAVTRAEQUIPCEN 82-M-0767-1, Contract N61339-82-M-0767, Icon, Inc. Dec. 1983, 134pp.

    A survey and analysis of training device 2E6 Air Combat Maneuvering Simulator instructor console operating problems was conducted. Feasible solutions were developed. General guidelines information was prepared.

62. Charles, J. P. Device 2F112 (F-14A WST) instructor console review. NAVTRAEQUIPCEN 81-M-1121-1, Contract N61339-81-M-1121, Icon, Inc. Dec. 1983, 138pp.

    A survey and analysis of training device 2F112 (F-14A Weapon System Trainer) instructor console operating problems was conducted. Feasible solutions were developed. General design guidelines were prepared.

63. Caro, P. W., Corley, W. E., Spears, W. D. and Blaiwes, A. S. Training effectiveness evaluation and utilization demonstration of a low cost cockpit procedures trainer. NAVTRAEQUIPCEN 78-C-0113-3, Contract N61339-78-C-0113, Seville Training Systems Corporation. Dec. 1983, 73pp.

    This study evaluated a prototype low cost cockpit procedures trainer (LCCPT) for the SH-3H aircraft. During Phase I of the study, pilots trained in the LCCPT were compared in subsequent SH-3H performance with a historical control group trained in Device 2C44, a much more expensive conventional cockpit procedures trainer. The two groups performed equally well in the SH-3H. During Phase II, the adaptability of the LCCPT to student-directed instruction with reduced instructor participation was evaluated. The students developed required proficiency levels and they appeared able to identify weaknesses in performance and to direct practice towards overcoming them.

64. Wightman, D. C. and Lintern, G. Part-task training of tracking in manual control. NAVTRAEQUIPCEN 81-C-0105-2, Contract N61339-81-C-0105, Canyon Research Group, Inc. Dec 1983, 30pp.

1983

This review of the effectiveness of part-task training focused on the instruction of tracking skills for manual control. Transfer of training methodology was emphasized and means of assessing transfer were discussed. The part-task training procedures of segmentation, fractionation and simplification were analyzed. Although fractionation methods were found to be less effective than whole-task training for multidimensional training tasks, improved task partitioning based on a better understanding of skill development might result in improved effectiveness of these part-task training methods. Simplification strategies were judged to be potentially useful in certain applications. The lack of a powerful theory of transfer of training was seen as a factor hindering the accurate assessment of part-task training methods. Although early research implied that part-task training was inferior to whole-task training for perceptual motor skills, current research is showing part-task methods to be at least as effective as, and sometimes superior to, whole-task training.

65. Waldrop, G. P., White, V. T. and McDonald, L. B. Computer assisted instruction system effectiveness on troubleshooting training. NAVTRAEQUIPCEN 82-C-0119-1, Contract N61339-82-C-0119, McDonald & Associates, Inc. Dec. 1983, 48pp.

This study addressed the performance effects of strategic troubleshooting computer assisted instruction (CAI) on troubleshooting behavior during performance tests on printed circuit boards. The purpose was to determine whether providing a CAI course as a supplement to regular training would improve subsequent student performance. The 54 subjects were Electronic Technician students who had completed self-paced course modules. Students were classified as high, medium, or low proficiency based on completion time for the modules. Three treatment conditions were imposed: troubleshooting CAI, control CAI, and control. The control CAI group received a BASIC programming course similar in length and presentation to the troubleshooting CAI to account for any Hawthorne effects resulting from CAI. In the two-way analysis of variance design, the independent variables were treatment condition and proficiency level, while the dependent variables included number of test points probed, time to probe, and success rate on the first fault diagnosis. Results indicated that troubleshooting CAI did not significantly improve performance, and was not an effective supplement to the regular instruction.

66. Wescourt, K. T. and Thorndyke, P. W. Alternative knowledge acquisition interface structures. NAVTRAEQUIPCEN 82-C-0151-1, Contract N61339-82-C-0151-1, Perceptronics, Inc. Dec. 1983, 99pp.

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This research developed a design concept for an interactive system to acquire domain knowledge from a training expert. A feasible concept for knowledge acquisition technology, building on prior research in artifical intelligence, involved the notion of class-generic systems for a related set of domains with fixed architecture and training capabilities. This concept was analyzed in the context of proposed Navy training systems for acquiring models of trainee performance during learning, rules of behavior for an automated opponent in a tactics trainer, and a knowledge base of facts to be subsequently presented to trainees for memorization. Data obtained from Navy domain experts and system builders indicate that the utility of knowledge acquisition systems will depend primarily on user skills, user motivation, and conceptual support provided by the system's user interface. Low-level details of the interaction medium and protocol are expected to be of secondary importance.

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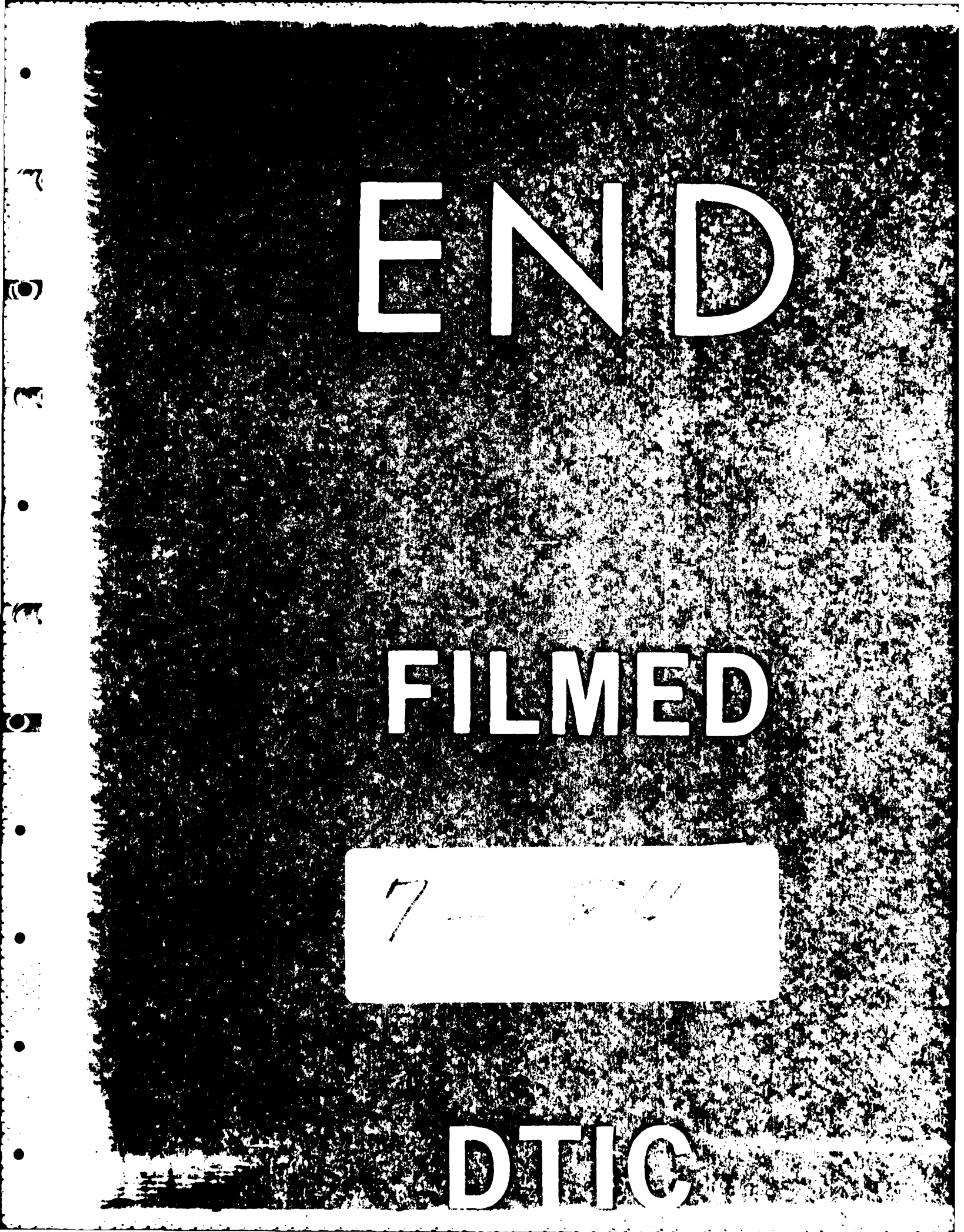
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